

REMARKS

Claims 1-48 were pending in this application when the present Office Action was mailed (June 15, 2005). Claim 43 has been amended to clarify the antecedent basis of the claim, without narrowing the scope of the claim. The amendment to claim 43 is not one that necessitates a new search and accordingly, a subsequent rejection of the pending claims on new grounds should not be made final. None of the remaining claims have been amended.

In the June 15, 2005 Office Action, claims 1-40 were allowed, claims 46-48 were objected to, and claims 41-45 were rejected. More specifically, the status of the application in light of this Office Action is as follows:

- (A) Claim 43 stands rejected under 35 U.S.C. § 112 as lacking proper antecedent basis;
- (B) Claims 41-44 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,811,470 to Bonner et al. ("Bonner");
- (C) Claim 45 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Bonner; and
- (D) Claims 1-40 are allowed with claims 46-48 indicated to be allowable if rewritten to be in independent form.

A. Response to the Section 112 Rejection

Claim 43 has been amended to clarify the antecedent basis of the term "surfactant." Accordingly, the section 112 rejection of claim 43 should be withdrawn.

B. Response to the Section 102 Rejection

Claims 41-44 were rejected under 35 U.S.C. § 102(e) as being anticipated by Bonner. For the reasons discussed below, Bonner does not teach or suggest all the features of the pending claims, and therefore does not anticipate the pending claims. Accordingly, the Section 102 rejections of these claims should be withdrawn.

Claim 41 is directed to a method for removing material from a microfeature workpiece having a doped silicon material and includes forming defects in the doped silicon material of the microfeature workpiece by disposing a first polishing liquid adjacent to the doped silicon material and removing a first portion of the doped silicon material by chemical-mechanical planarization. The first polishing liquid has a first composition. The method further includes disposing a second polishing liquid adjacent to the doped silicon material and removing a second portion of the doped silicon material and the defects by chemical-mechanical planarization. The second polishing liquid has a second composition different than the first composition. Accordingly, methods having features of claim 43 can be used to efficiently remove doped silicon materials without any defects.

Bonner discloses a method for planarizing a substrate surface with minimal defects in surface dielectric layers (Abstract). More specifically, Bonner discloses polishing a substrate comprising at least a first dielectric material and a second dielectric material with a first polishing composition having a first selectivity, and then polishing the substrate with a second polishing composition having a second selectivity different than the first selectivity (Bonner at column 5, lines 21-29). Dielectric materials contemplated by Bonner include those conventionally employed in semiconductor devices, such as silicon dioxide (SiO_2), silicon nitride (Si_3N_4), phosphorus doped silicon glass (PSG), boron-phosphorus doped silicon glass (BPSG), and other forms of silicon oxide (SiO_2). (Bonner at column 9, lines 20-25). The main thrust of Bonner's technique is to minimize defects on the dielectric layers by selectively varying removal rates of different types of dielectric materials using different polishing compositions (see generally Bonner at column 8, lines 12-25).

However, Bonner fails to disclose a method comprising removing "doped silicon" materials from a microfeature workpiece as recited in claim 41. Doped silicon materials include both doped amorphous silicon and doped polysilicon (Specification at page 6, paragraph 0018). Amorphous silicon is the non-crystalline allotropic form of silicon (Si), in which some silicon atoms may have dangling bonds. Polysilicon is also formed by silicon atoms (Si) and consists of single-crystal regions separated by grain boundaries.

Both amorphous silicon and polysilicon can be doped to be used as electrodes and interconnects in circuits. On the other hand, the dielectric materials disclosed in Bonner, such as silicon dioxide (SiO_2), silicon nitride (Si_3N_4), PSG (a binary glass consisting of P_2O_5 and SiO_2), and BPSG (a ternary glass consisting of B_2O_3 , P_2O_5 and SiO_2) are not "doped silicon" materials. Doping silicon oxide (SiO_2) to form PSG or BPSG simply improves certain processing characteristics, such as higher etching selectivity, but does not affect electrical conductivity at all. All these disclosed dielectric materials have different molecular and crystalline structures from the doped silicon material as recited in claim 41. Such differences in molecular and crystalline structures significantly affect a material's response to polishing due to different chemical and physical properties, such as hardness, durability, responsiveness to chemical passivation, and etc. Thus, a polishing technique suitable for one kind of material may be unsuitable for another kind having different molecular and crystalline structures. Therefore, there is no motivation or suggestion to modify a polishing technique suitable for selectively removing dielectric materials to a technique for removing doped silicon materials, and there is no reasonable expectation of success. Thus, Bonner fails to provide a motivation to modify the disclosed method to a method for removing doped silicon materials from a substrate. For at least the above stated reasons, Bonner does not teach all the features of the pending claim 41, and as a result does not anticipate claim 41. Accordingly, the Section 102 rejection of claim 41 should be withdrawn.

Claims 43-44 all depend from claim 41. Accordingly, the Section 102 rejections of these claims should be withdrawn for the reasons discussed above and for the additional features of these dependent claims.

C. Response to the Section 103 Rejection

Claim 45 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Bonner. Claim 45 depends from claim 41. Claim 45 includes, in addition to the features discussed above with respect to claim 41, a second polishing liquid that includes from about 0.001% to about 1.0% surfactant by weight. The surfactant is generally non-ionic. For the reasons discussed below, a *prima facie* case of

obviousness has not been made in view of Bonner. Accordingly, the Section 103 rejection of claim 45 should be withdrawn.

First, the cited references do not teach or suggest all the features of claim 45. As discussed above, Bonner fails to teach or suggest a method comprising removing "doped silicon" material from a microfeature workpiece as recited in claim 41. Thus, the combination of Bonner and the knowledge of choosing a non-ionic surfactant in certain concentrations does not teach or suggest all the features of claim 45. Furthermore, Bonner does not provide a motivation or suggestion to make the combination above. As discussed above, Bonner does not provide a motivation to modify the disclosed method for removing dielectric materials to a method for removing doped silicon materials from a substrate. In addition, Bonner teaches away from using a polishing liquid including a generally non-ionic surfactant, as recited in claim 45, because Bonner discloses that a poly-carboxylate surfactant, which is an anionic surfactant, may be used as an additive in a polishing solution (Bonner at column 6, lines 61-64). Therefore, a *prima facie* case of obviousness has not been made. Accordingly, the Section 103 rejection of claim 45 should be withdrawn.

D. Response to the Indication of Allowable Subject Matter.

The allowed and allowable claims have not been amended in this response. Claims 46-48 stand objected to as being dependent upon a rejected base claim. As discussed above, the rejection of claim 41 should be withdrawn. Claims 46-48 depend from claim 41. Thus, the objection of claims 46-48 for depending from a rejected base claim should be withdrawn.

E. Conclusion

In view of the foregoing, the claims pending in the application comply with the requirements of 35 U.S.C. § 112 and patentably define over the applied art. A Notice of Allowance is, therefore, respectfully requested. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-3257.

Respectfully submitted,
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